BRUKL Output Document

HM Government

Compliance with England Building Regulations Part L 2013

Project name

04 Be Green - IMRI Wing (L2B)

As designed

Date: Fri Jan 25 14:38:13 2019

Administrative information

Building Details

Address: LONDON,

Certification tool

Calculation engine: SBEM

Calculation engine version: v5.4.b.0

Interface to calculation engine: DesignBuilder SBEM

Interface to calculation engine version: v5.4.0

BRUKL compliance check version: v5.4.b.0

Owner Details

Name:

Telephone number:

Address: , ,

Certifier details

Name: Levent Ulfet

Telephone number: 020 8150 8288

Address: The Enterprise Centre Cranborne Road, Potters Bar, EN6 3DQ

Criterion 1: The calculated CO_2 emission rate for the building must not exceed the target

CO_2 emission rate from the notional building, $kgCO_2/m^2.annum$	97.3
Target CO_2 emission rate (TER), $kgCO_2/m^2.annum$	97.3
Building CO_2 emission rate (BER), $kgCO_2/m^2.annum$	73.5
Are emissions from the building less than or equal to the target?	BER =< TER
Are as built details the same as used in the BER calculations?	Separate submission

Criterion 2: The performance of the building fabric and fixed building services should achieve reasonable overall standards of energy efficiency

Values which do not achieve the standards in the Non-Domestic Building Services Compliance Guide and Part L are displayed in red.

Building fabric

Element	$U_{a\text{-}Limit}$	$U_{a\text{-}Calc}$	$U_{i\text{-}Calc}$	Surface where the maximum value occurs*
Wall**	0.35	0.15	0.15	Level 02 - Reception B2312_W_8
Floor	0.25	0.15	0.15	Level 02 - Reception B2312_S_3
Roof	0.25	0.15	0.15	Level 02 - Reception B2312_R_5
Windows***, roof windows, and rooflights	2.2	1.4	1.4	Level 02 - GAIT B2322_G_11
Personnel doors	2.2	2.2	2.2	Level 02 - GAIT B2322_D_8
Vehicle access & similar large doors	1.5	-	-	"No external vehicle access doors"
High usage entrance doors	3.5	-	-	"No external high usage entrance doors"

$U_{a\text{-}Limit}$ = Limiting area-weighted average U-values [$W/(m^2K)$]
$U_{a\text{-}Calc}$ = Calculated area-weighted average U-values [$W/(m^2K)$]
$U_{i\text{-}Calc}$ = Calculated maximum individual element U-values [$W/(m^2K)$]

* There might be more than one surface where the maximum U-value occurs.
** Automatic U-value check by the tool does not apply to curtain walls whose limiting standard is similar to that for windows.
*** Display windows and similar glazing are excluded from the U-value check.
N.B.: Neither roof ventilators (inc. smoke vents) nor swimming pool basins are modelled or checked against the limiting standards by the tool.

Air Permeability	Worst acceptable standard	This building
$m^3/(h.m^2)$ at 50 Pa	10	10

Building services

The standard values listed below are minimum values for efficiencies and maximum values for SFPs. Refer to the Non-Domestic Building Services Compliance Guide for details.

Whole building lighting automatic monitoring & targeting with alarms for out-of-range values	YES
Whole building electric power factor achieved by power factor correction	>0.95

1- VRF System

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	4.28	3.7	-	-	-
Standard value	2.5*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for all types >12 kW output, except absorption and gas engine heat pumps. For types <=12 kW output, refer to EN 14825 for limiting standards.

2- AHU 02 (via existing Boiler/CHP/Chiller)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.88	2.6	-	1.51	0.71
Standard value	0.91*	2.55	N/A	1.6^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

3- AHU 01 (via existing Boiler/CHP/Chiller)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.88	2.6	-	1.6	0.71
Standard value	0.91*	2.55	N/A	1.6^	0.5
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

^ Limiting SFP may be extended by the amounts specified in the Non-Domestic Building Services Compliance Guide if the system includes additional components as listed in the Guide.

4- LST Radiators (via existing Boiler/CHP)

	Heating efficiency	Cooling efficiency	Radiant efficiency	SFP [W/(l/s)]	HR efficiency
This system	0.88	-	-	-	-
Standard value	0.91*	N/A	N/A	N/A	N/A
Automatic monitoring & targeting with alarms for out-of-range values for this HVAC system					YES

* Standard shown is for gas single boiler systems <=2 MW output. For single boiler systems >2 MW or multi-boiler systems, (overall) limiting efficiency is 0.86. For any individual boiler in a multi-boiler system, limiting efficiency is 0.82.

1- HWS from CHP

	Water heating efficiency	Storage loss factor [kWh/litre per day]
This building	Hot water provided by HVAC system	-
Standard value	N/A	N/A

1- CHP 1

	CHPQA quality index	CHP electrical efficiency
This building	110	0.78
Standard value	105	0.2

Local mechanical ventilation, exhaust, and terminal units

ID	System type in Non-domestic Building Services Compliance Guide
A	Local supply or extract ventilation units serving a single area
B	Zonal supply system where the fan is remote from the zone
C	Zonal extract system where the fan is remote from the zone
D	Zonal supply and extract ventilation units serving a single room or zone with heating and heat recovery
E	Local supply and extract ventilation system serving a single area with heating and heat recovery
F	Other local ventilation units
G	Fan-assisted terminal VAV unit
H	Fan coil units
I	Zonal extract system where the fan is remote from the zone with grease filter

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
Level 04 - Theatre & MRI B4321	-	-	-	-	-	-	-	-	-	-	N/A
Level 04 - MRI Equipement B4304	-	-	-	-	-	-	-	-	-	-	N/A
Level 04 - Corridor B4300	-	-	-	-	-	-	-	-	-	-	N/A
Level 04 - IT Hub B4305	-	-	-	-	-	-	-	-	-	-	N/A
Level 04 - UPS B4308	-	-	-	-	-	-	-	-	-	-	N/A
Level 04 - LV Switch B4306	-	-	-	-	-	-	-	-	-	-	N/A
Level 02 - Reception B2312	-	-	-	-	-	-	-	-	-	-	N/A
Level 02 - GAIT B2322	-	-	-	-	-	-	-	-	-	-	N/A
Level 02 - Gym B2330	-	-	-	-	-	-	-	-	-	-	N/A
Level 02 - Consult B2318	-	-	-	-	-	-	-	-	-	-	N/A
Level 02 - Consult B2316	-	-	-	-	-	-	-	-	-	-	N/A
Level 02 - Plaster Rm B2320	-	-	-	-	-	-	-	-	-	-	N/A
Level 03 - MRI B3322	-	-	-	-	-	-	-	-	-	-	N/A
Level 03 - Anaesthetic Rm B3320	-	-	-	-	-	-	-	-	-	-	N/A
Level 03 - Control Rm B3324	-	-	-	-	-	-	-	-	-	-	N/A
Level 03 - Theatre B3314	-	-	-	-	-	-	-	-	-	-	N/A
Level 03 - Prep Rm B3312	-	-	-	-	-	-	-	-	-	-	N/A
Level 03 - Anaesthetic Rm B3318	-	-	-	-	-	-	-	-	-	-	N/A
Level 02 - Corridor B2300	-	-	-	-	-	-	-	-	-	-	N/A
Level 02 - IT Hub B2302	-	-	-	-	-	-	-	-	-	-	N/A
Level 02 - Disposal Rm B2304	-	-	-	-	-	-	-	-	-	-	N/A
Level 02 - Changing B2306	-	-	-	-	-	-	-	-	-	-	N/A
Level 02 - Store B2309	-	-	-	-	-	-	-	-	-	-	N/A
Level 02 - Store B2310	-	-	-	-	-	-	-	-	-	-	N/A
Level 02 - Store B2310	-	-	-	-	-	-	-	-	-	-	N/A
Level 02 - Corridor B2314	-	-	-	-	-	-	-	-	-	-	N/A
Level 02 - WC B2324	-	-	0.5	-	-	-	-	-	-	-	N/A
Level 02 - Cleaners B2328	-	-	-	-	-	-	-	-	-	-	N/A
Level 02 - Store B2331	-	-	-	-	-	-	-	-	-	-	N/A
Level 02 - Store B2321	-	-	-	-	-	-	-	-	-	-	N/A
Level 02 - Store B2317	-	-	-	-	-	-	-	-	-	-	N/A

Zone name	SFP [W/(l/s)]									HR efficiency	
ID of system type	A	B	C	D	E	F	G	H	I		
Standard value	0.3	1.1	0.5	1.9	1.6	0.5	1.1	0.5	1	Zone	Standard
Level 02 - WC B2326	-	-	0.5	-	-	-	-	-	-	-	N/A
Level 03 - Corridor B3308	-	-	-	-	-	-	-	-	-	-	N/A
Level 03 - Dirty Utility B3310	-	-	-	-	-	-	-	-	-	-	N/A
Level 03 - Corridor B3306	-	-	-	-	-	-	-	-	-	-	N/A
Level 03 - Stairway B3ST-06	-	-	-	-	-	-	-	-	-	-	N/A
Level 03 - Metal Check B3326	-	-	-	-	-	-	-	-	-	-	N/A
Level 03 - Sterile Store B3302	-	0.8	-	-	-	-	-	-	-	-	N/A
Level 03 - Corridor B3300	-	-	-	-	-	-	-	-	-	-	N/A
Level 03 - WC B3304	-	-	0.5	-	-	-	-	-	-	-	N/A

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	Luminaire	Lamp	Display lamp	General lighting [W]
Standard value	60	60	22	
Level 04 - Theatre & MRI B4321	100	-	-	294
Level 04 - MRI Equipement B4304	100	-	-	35
Level 04 - Corridor B4300	-	100	-	48
Level 04 - IT Hub B4305	100	-	-	23
Level 04 - UPS B4308	100	-	-	32
Level 04 - LV Switch B4306	100	-	-	52
Level 02 - Reception B2312	-	83	83	356
Level 02 - GAIT B2322	-	83	-	252
Level 02 - Gym B2330	-	83	-	240
Level 02 - Consult B2318	-	107	-	150
Level 02 - Consult B2316	-	107	-	161
Level 02 - Plaster Rm B2320	-	107	-	164
Level 03 - MRI B3322	-	60	-	1673
Level 03 - Anaesthetic Rm B3320	-	95	-	399
Level 03 - Control Rm B3324	-	95	-	448
Level 03 - Theatre B3314	-	95	-	1061
Level 03 - Prep Rm B3312	-	95	-	357
Level 03 - Anaesthetic Rm B3318	-	95	-	411
Level 02 - Corridor B2300	-	82	-	59
Level 02 - IT Hub B2302	106	-	-	18
Level 02 - Disposal Rm B2304	107	-	-	26
Level 02 - Changing B2306	-	106	-	24
Level 02 - Store B2309	96	-	-	17
Level 02 - Store B2310	96	-	-	103
Level 02 - Store B2310	96	-	-	11
Level 02 - Corridor B2314	-	82	-	50
Level 02 - WC B2324	-	86	-	61
Level 02 - Cleaners B2328	86	-	-	44
Level 02 - Store B2331	107	-	-	51
Level 02 - Store B2321	86	-	-	43

General lighting and display lighting	Luminous efficacy [lm/W]			
Zone name	**Luminaire**	**Lamp**	**Display lamp**	**General lighting [W]**
Standard value	60	60	22	
Level 02 - Store B2317	96	-	-	10
Level 02 - WC B2326	-	86	-	32
Level 03 - Corridor B3308	-	66	-	100
Level 03 - Dirty Utility B3310	95	-	-	53
Level 03 - Corridor B3306	-	66	-	78
Level 03 - Stairway B3ST-06	-	86	-	61
Level 03 - Metal Check B3326	-	95	-	330
Level 03 - Sterile Store B3302	95	-	-	92
Level 03 - Corridor B3300	-	66	-	86
Level 03 - WC B3304	-	86	-	44

Criterion 3: The spaces in the building should have appropriate passive control measures to limit solar gains

Zone	Solar gain limit exceeded? (%)	Internal blinds used?
Level 02 - Reception B2312	N/A	N/A
Level 02 - GAIT B2322	NO (-79.1%)	NO
Level 02 - Gym B2330	NO (-81.6%)	NO
Level 02 - Consult B2318	NO (-60.3%)	NO
Level 02 - Consult B2316	NO (-39.5%)	NO
Level 02 - Plaster Rm B2320	NO (-65.8%)	NO
Level 03 - MRI B3322	N/A	N/A
Level 03 - Anaesthetic Rm B3320	N/A	N/A
Level 03 - Control Rm B3324	N/A	N/A
Level 03 - Theatre B3314	N/A	N/A
Level 03 - Prep Rm B3312	N/A	N/A
Level 03 - Anaesthetic Rm B3318	N/A	N/A
Level 03 - Metal Check B3326	N/A	N/A

Criterion 4: The performance of the building, as built, should be consistent with the calculated BER

Separate submission

Criterion 5: The necessary provisions for enabling energy-efficient operation of the building should be in place

Separate submission

EPBD (Recast): Consideration of alternative energy systems

Were alternative energy systems considered and analysed as part of the design process?	YES
Is evidence of such assessment available as a separate submission?	NO
Are any such measures included in the proposed design?	YES

Technical Data Sheet (Actual vs. Notional Building)

Building Global Parameters

	Actual	Notional
Area [m^2]	880.7	880.7
External area [m^2]	2028.4	2028.4
Weather	LON	LON
Infiltration [m^3/hm^2@ 50Pa]	10	3
Average conductance [W/K]	437.71	648.42
Average U-value [W/m^2K]	0.22	0.32
Alpha value* [%]	80	10.49

* Percentage of the building's average heat transfer coefficient which is due to thermal bridging

Building Use

% Area	Building Type
	A1/A2 Retail/Financial and Professional services
	A3/A4/A5 Restaurants and Cafes/Drinking Est./Takeaways
	B1 Offices and Workshop businesses
	B2 to B7 General Industrial and Special Industrial Groups
	B8 Storage or Distribution
	C1 Hotels
89	**C2 Residential Institutions: Hospitals and Care Homes**
	C2 Residential Institutions: Residential schools
	C2 Residential Institutions: Universities and colleges
	C2A Secure Residential Institutions
	Residential spaces
	D1 Non-residential Institutions: Community/Day Centre
	D1 Non-residential Institutions: Libraries, Museums, and Galleries
	D1 Non-residential Institutions: Education
	D1 Non-residential Institutions: Primary Health Care Building
	D1 Non-residential Institutions: Crown and County Courts
11	**D2 General Assembly and Leisure, Night Clubs, and Theatres**
	Others: Passenger terminals
	Others: Emergency services
1	**Others: Miscellaneous 24hr activities**
	Others: Car Parks 24 hrs
	Others: Stand alone utility block

Energy Consumption by End Use [kWh/m^2]

	Actual	Notional
Heating	38.21	36.41
Cooling	51.69	37.8
Auxiliary	55.31	68.8
Lighting	45.6	63.96
Hot water	6.92	6.29
Equipment*	248.18	248.18
TOTAL**	**169.34**	**213.27**

* Energy used by equipment does not count towards the total for consumption or calculating emissions.
** Total is net of any electrical energy displaced by CHP generators, if applicable.

Energy Production by Technology [kWh/m^2]

	Actual	Notional
Photovoltaic systems	0	0
Wind turbines	0	0
CHP generators	28.4	0
Solar thermal systems	0	0

Energy & CO_2 Emissions Summary

	Actual	Notional
Heating + cooling demand [MJ/m^2]	769.61	737.95
Primary energy* [kWh/m^2]	432.57	573.67
Total emissions [kg/m^2]	73.5	97.3

* Primary energy is net of any electrical energy displaced by CHP generators, if applicable.

HVAC Systems Performance

System Type		Heat dem MJ/m2	Cool dem MJ/m2	Heat con kWh/m2	Cool con kWh/m2	Aux con kWh/m2	Heat SSEEF	Cool SSEER	Heat gen SEFF	Cool gen SEER
[ST] No Heating or Cooling										
	Actual	113.6	2.8	0	0	0	0	0	0	0
	Notional	62.5	16.7	0	0	0	0	0	----	----
[ST] Split or multi-split system, [HS] Heat pump (electric): air source, [HFT] Electricity, [CFT] Electricity										
	Actual	268.4	166	17.8	16.7	0	4.2	2.77	4.28	3.7
	Notional	216.8	347.8	24.8	26.8	0	2.43	3.6	----	----
[ST] Constant volume system (fixed fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	2.4	2674	0.7	258.9	191	0.96	2.87	0.88	5.11
	Notional	28.5	2110.4	9.7	162.8	170.5	0.82	3.6	----	----
[ST] Constant volume system (fixed fresh air rate), [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	20.6	1621.8	5.9	159.5	289.3	0.97	2.83	0.88	5.11
	Notional	230.4	1439.7	78.2	111.1	432	0.82	3.6	----	----
[ST] Central heating using water: radiators, [HS] LTHW boiler, [HFT] Natural Gas, [CFT] Electricity										
	Actual	25.7	168.1	8.6	0	4.4	0.83	0	0.88	0
	Notional	194.1	282.4	65.8	0	4.9	0.82	0	----	----

Key to terms

Heat dem [MJ/m2] = Heating energy demand
Cool dem [MJ/m2] = Cooling energy demand
Heat con [kWh/m2] = Heating energy consumption
Cool con [kWh/m2] = Cooling energy consumption
Aux con [kWh/m2] = Auxiliary energy consumption
Heat SSEFF = Heating system seasonal efficiency (for notional building, value depends on activity glazing class)
Cool SSEER = Cooling system seasonal energy efficiency ratio
Heat gen SSEFF = Heating generator seasonal efficiency
Cool gen SSEER = Cooling generator seasonal energy efficiency ratio
ST = System type
HS = Heat source
HFT = Heating fuel type
CFT = Cooling fuel type

Key Features

The Building Control Body is advised to give particular attention to items whose specifications are better than typically expected.

Building fabric

Element	$U_{i\text{-}Typ}$	$U_{i\text{-}Min}$	Surface where the minimum value occurs*
Wall	0.23	0.15	Level 02 - Reception B2312_W_8
Floor	0.2	0.15	Level 02 - Reception B2312_S_3
Roof	0.15	0.15	Level 02 - Reception B2312_R_5
Windows, roof windows, and rooflights	1.5	1.4	Level 02 - GAIT B2322_G_11
Personnel doors	1.5	2.2	Level 02 - GAIT B2322_D_8
Vehicle access & similar large doors	1.5	-	"No external vehicle access doors"
High usage entrance doors	1.5	-	"No external high usage entrance doors"

$U_{i\text{-}Typ}$ = Typical individual element U-values [W/(m²K)] $U_{i\text{-}Min}$ = Minimum individual element U-values [W/(m²K)]

* There might be more than one surface where the minimum U-value occurs.

Air Permeability	Typical value	This building
m³/(h.m²) at 50 Pa	5	10